



BioRECO₂VER

**Biological routes for CO₂ conversion into
chemical building blocks**



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Biological routes for CO₂ conversion into chemical building blocks

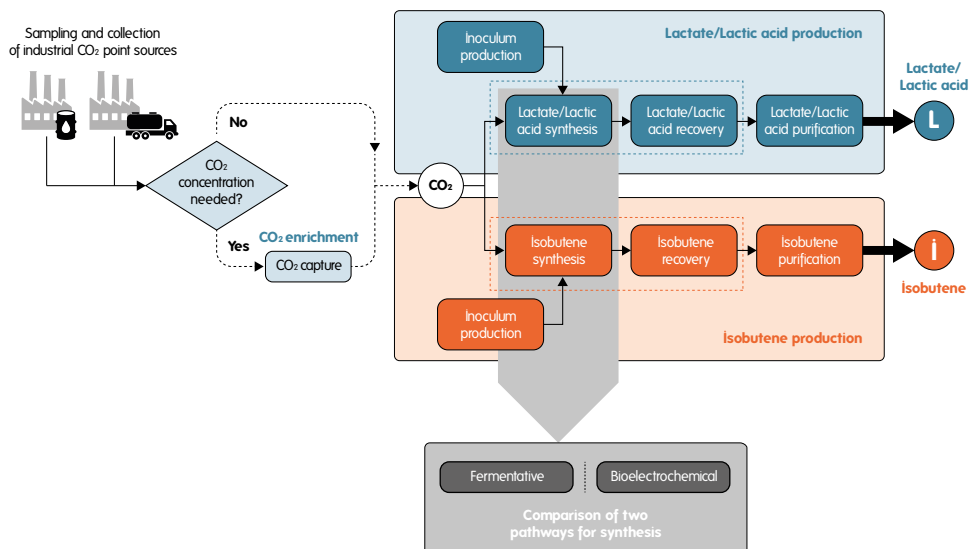
BioRECO₂VER aims to demonstrate the technical feasibility of more energy efficient and sustainable non-photo-synthetic, biotechnological processes for the capture and conversion of CO₂ from industrial point sources like refineries and cement production plants into valuable platform chemicals, such as isobutene and lactate.

To overcome several of the existing technical and economic barriers for CO₂ conversion by industrial biotechnology, BioRECO₂VER will focus on minimizing gas pre-treatment costs, maximizing gas transfer in bioreactors, preventing

product inhibition, minimizing product recovery costs, reducing footprint and improving scalability.

To this end, a hybrid enzymatic process will be investigated for CO₂ capture from industrial point sources and conversion of captured CO₂ into the targeted end-products will be realized through three different proprietary microbial platforms which are representative of a much wider range of products and applications. Bio-process development and optimization will occur along two lines: fermentation and bioelectrochemical systems.

The general concept of BioRECO₂VER





Climate change and the need for alternative carbon feedstocks in chemical industry

Greenhouse gas emissions could cause global average temperatures to increase by 4°C or more by 2100 and by 1.5 to 2 times as much in many midcontinent and northern locations.

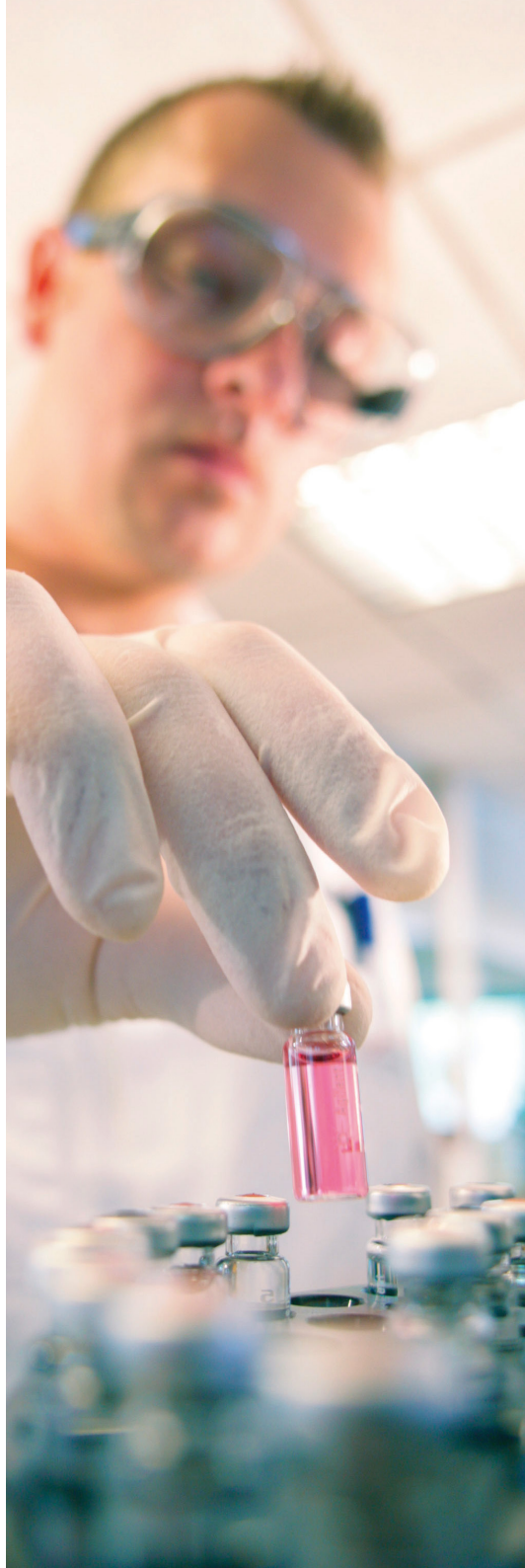
These emissions are strongly linked to the current (>90%) fossil-based processes to produce chemicals and materials. Since carbon is an essential constituent in many chemicals and materials, the chemical industry thus faces the long-term challenge to move towards a CO₂ neutral rather than a

carbon-free world and efforts are undertaken to broaden its feedstock basis.

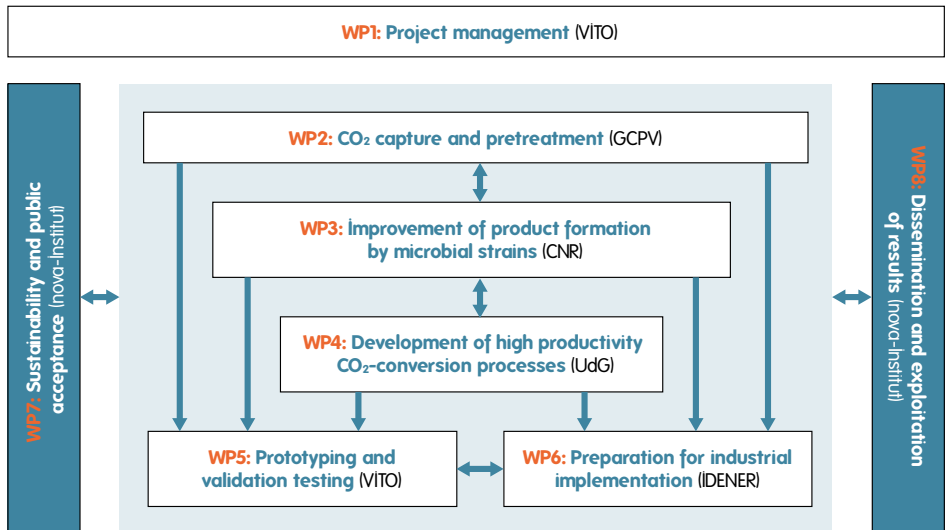
While biomass is increasingly being used, CO₂ and renewable energy are the only abundant sources of energy and carbon on the long term and the ultimate sustainable resources in the circular economy. Therefore, carbon capture and the utilization via microbial conversion into valuable platform chemicals is combined within BioRECO₂VER to set a representative base for a future much wider range of products and applications.

Targets of BioRECO₂VER:

- Development and application of robust enzymes for efficient CO₂ capture from industrial point sources by combining enzymatic absorption with ionic liquid-amine blends
- Development of three different microbial platforms for CO₂ conversion into platform chemicals using carbon-free energy supply
- Development of novel fermenter designs to increase fermentation efficiency and optimize process conditions
- Development of bioelectrochemical systems that use *in situ* generated H₂ and renewable electricity as the energy source
- Validation of the most promising isobutene and lactate production route at technology readiness level 5 on real off-gases
- Multidisciplinary design optimization and preparation for industrial implementation
- Techno-economic and sustainability assessment



Work packages of the BioRECO₂VER project



Project consortium





PROJECT COORDINATOR



Dr. Heleen De Wever

Flemish Institute for
Technological Research (VITO)
Boeretang 200
2400 Mol, Belgium

Phone: +32 14 33 69 32
www.vito.be
heleen.dewever@vito.be

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Svenja Geerken

nova-Institut GmbH
Industriestraße 300
50354 Hürth
Germany

Phone: +49 2233 48 1442
www.nova-institut.de
www.bio-based.eu
svenja.geerken@nova-institut.de



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